

7.7.4/10

ROUTING SLIP

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File

HRT-2

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October 4, 1961

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Dear Sirs:

Enclosed are four copies of the minutes of the meeting
held on September 15, 1961.

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Sincerely yours,

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Engineering Group Leader

zmt

"NOTE: THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, ACT 25 JUNE 1948 (PUBLIC LAW 772 - 80TH CONG; 18 U.S.C. 793 AND 794; 62 STAT. 683). THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW"

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Cover letter

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Minutes of the Meeting with the Washington Customer

[] on September 15, 1961

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Those present were: Customer: Nick G.

[] Hil T.
Mort W.
Len B.

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This meeting was held to discuss a number of problems the customer has encountered with the HRT-2 beacon. These problems have been discovered during field tests and during conversations between Nick and the actual users of this type of equipment.

The customer has decided that they would like to have the 50 ohm antenna terminals color coded. The "hot" terminal will be red and the ground terminal black. Both terminals will be metal binding posts. It was decided that the stainless steel grounding rod must be strengthened by enlarging its diameter and tempering it.

It was felt that the pilot light which doubles as battery condition indicator was a desirable feature but some means should be devised to direct the light on to the meter face. This will be investigated. The customer stated that one user of the beacon had difficulty inserting the two-prong connector into the battery unless the battery was inserted with its label up. If the battery was inserted with the label down, the connector could not be inserted. To correct this, the battery cable will be lengthened slightly in future units.

The customer requested that a curved arrow be imprinted on the beacon housing above the meter to indicate which direction the meter needle deflects when it is going "up-scale". On one of the customer's field tests the beacon transmitter was connected to the ANA-42 antenna using the 50 ohm output terminals. It was found that the meter reading on the transmitter changed when the position of the grounding strap was changed. This phenomena will be investigated at [] in the near future.

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The most serious difficulty encountered in the customer's field tests was a "hot" transmitter housing when using the 16 foot antenna. The customer stated that the grounding rod had been used when this condition was noted. The only explanation that could be offered at the time of the meeting was that the unit was not completely grounded either because of very poor ground conductivity or because the grounding braid was too long. This problem will have to be solved as soon as possible since the customer intends to use this device on or near beaches where the 16 foot antenna must be used and where grounding is difficult. Motorola will investigate the problem and determine if the use of ground radials and shortening the grounding strap will cure the problem.

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The customer inquired about the possibility of making the meter reading correlate with power output. This is not feasible since the meter indicates r-f current, and the loads that the unit operates into vary considerably in resistance and reactance. Because of these variations it would be impossible to correlate a current (or voltage) reading with power, and, therefore, the meter can only be used as a tuning indicator. It was stated that one of the customer's engineers measured the power output on some type of wattmeter, and the meter indicated only four watts output into the 50 ohm load. [redacted] explained that all wattmeters they are acquainted with cannot be used to give accurate readings at frequencies below 30 megacycles. This is because a small coupling capacitor is used between the load and the rectifying diode in order to cover the 30 to 500 megacycle range. Because this capacitor is small, the voltage drop across it at frequencies below 30 megacycles is too high, and as a result, the meter reads low. This was demonstrated to the customer at this meeting. A "Bird" Model 61 wattmeter was connected to the 50 ohm terminals of a HRT-2 beacon. The unit was turned on, tuned up, and found to be working properly. The wattmeter read four watts. The wattmeter can be used as an accurate 50 ohm load, but to determine the correct power output the voltage across this load should be measured with a vacuum-tube voltmeter (Hewlett-Packard 400-D or 410-B) and the power computed from this reading. 50X1

The customer requested that the beacon case be redesigned so that the screws holding on the bottom plate and the battery compartment end plate be captivated. [redacted] will investigate the feasibility of doing this. The customer also requested that some sort of polarity reversal protection be incorporated in the units. This can be done using a high forward current diode (perhaps the collector to base diode of a power transistor) providing the voltage drop is not too high. Another possibility is to check the reliability of the fuse and be sure that it will protect the beacon circuitry and the power source if the polarity is accidentally reversed. It was also requested that the screwdriver provided with each beacon should be chained to the housing. It may be desirable to attach the screwdriver to the side of the housing opposite from that where the antenna is clipped. 50X1

The customer inquired about the ability of the HRT-2 to withstand severe shock in the form of a three-foot drop to a concrete floor. He was assured that this test would be made by dropping the unit on all six of its faces. It was pointed out that denting of the housing and perhaps bending of the clips on the sides may occur, but the unit will be operative after the drop test. Particular concern was shown about the glass in the meter and the suggestion was made that perhaps a plastic or celluloid cover could be used. This will probably not be done since the meter being used is waterproof and ruggedized, and the glass is well protected by a heavy metal rim.

The mechanisms used to permit inductive tuning of the oscillator and final from the top panel of the HRT-2 were shown to the customer. The threads on the tuning slugs are used to translate the rotary motion to linear motion. As a result, many turns of the knobs (32 for the final and 24 for the oscillator) are necessary to move the slugs one inch. It was explained to the customer that to get a coarser pitch on the threads in order to decrease the number of turns would require very special tooling if it were possible at all. Also, the torque

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required to tune would increase with a coarser pitch. Therefore, the mechanisms will not be changed. The shafts for the tunable controls that extend above the top panel will be as the customer saw them at this meeting. Each shaft will have a knob held on by a set screw. The shafts will have a screw driver slot in them. The customer asked about the crystal socket to be used in the beacons. It was decided that only the large socket (for .093 inch pins) would be mounted in the units, and any crystals procured would be ordered with the .093 inch pins. Crystals now on hand with .050 inch pins can be easily modified with pin adapters to fit the larger socket. By using the larger socket, more tension is exerted on the crystal pins making it practically impossible to jar or shake the crystal loose.

The antenna test and test transmitter project (Task Order 25) was discussed next. The results of [] efforts to feed a 150 foot vertical wire antenna were presented. It was found that due to the large L to D ratio of this antenna there was a considerable amount of reactance that had to be tuned out. This was accomplished by connecting the wire antenna in series with a variable capacitor (48 pf. to 79 pf.) which was connected to the terminal used for the 16 foot whip antenna. For best results, the internal antenna tuning capacitor should be set for minimum capacity. [] will design an adapter which will attach to the threaded hole in the 16 foot whip antenna terminal and will contain the required capacitor. The wire antenna will be attached to the other end of this adaptor.

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The customer mentioned some of the problems they would like to have Motorola investigate on Task Order 25. These include shorter vertical wire antennas, slant wire antennas and unusual configurations that require little or no tuning and can be erected quickly. In all cases patterns should be checked and the field strengths should be compared with those secured using the ANA-42. A universal matching accessory will be developed to be used to match a variety of antenna loads.

The test transmitter development was briefly reviewed. The customer was informed that the unit being designed will probably generate a field of 200 to 300 microvolts per meter at a distance of 100 feet.

Due to the great number of changes requested by the customer, [] will deliver two more preliminary models before a quantity of ten is delivered. A tentative schedule of future deliveries is as follows:

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Quantity	Date
2	October 16, 1961
10	October 30, 1961
13	November 30, 1961

Also on October 16, an attempt will be made to give the customer one or two packaged test transmitters. Manuals will be supplied with the shipment of ten units. The two units to be supplied by October 16 will have all the changes requested as of this meeting.

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The customer was told that batteries were not available at the time of the meeting because [] had not been able to supply them. They are expected in during the week of September 30 and ten will be shipped to the customer as soon as they are received.

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A trip to Washington has been tentatively arranged for the week ending October 7. At this time the customer will be shown a mechanical sample of the HRT-2 as it will be delivered on October 16. Also at this time engineers at [] will discuss test results and procedures with the customer's personnel.

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